CLAIMS

What is claimed is:

- A method, comprising the steps of: 1
- driving a polyphase motor with a drive voltage; and 2
- 3 sampling a back emf of a selected phase of the motor to determine positional error
- of a motor rotor only while a drive voltage of the selected phase is substantially zero. 4
- 1 2. The method of claim 1 wherein the drive voltage is substantially sinusoidal.
- 1 3. The method of claim 1 wherein the drive voltage is substantially trapezoidal.
- 1 4. The method of claim 1 wherein the polyphase motor is a component of an
- 2 implantable medical device.
- 1 5. The method of claim 4 wherein the medical device is a heart assist pump.
- 1 6. The method of claim 1 wherein the motor is a brushless DC motor.
- 1 7. The method of claim 6 wherein the motor is a three phase brushless DC motor.
- 1 8. The method of claim 1 wherein the drive voltage of the selected phase passes
- 2 through zero during sampling.

- 1 9. The method of claim 1 wherein the selected drive voltage does not pass through
- 2 zero during sampling.
- 1 10. The method of claim 1 further comprising the step of:
- 2 controlling commutation of the motor in accordance with the sampled back emf.
- 1 11. The method of claim 1 further comprising the step of:
- 2 varying a frequency of the drive voltage in accordance with the sampled back emf.
- 1 12. The method of claim 1 further comprising the step of:
- 2 generating a speed control signal corresponding to a difference between a desired
- 3 rotor angular velocity and a rotor speed inferred from a frequency of the drive voltage; and
- 4 varying an amplitude of the drive voltage in accordance with the speed control
- 5 signal.
- 1 13. An apparatus, comprising:
- 2 a brushless DC motor;
- a commutation control providing a commutation control signal for a selected phase
- 4 of the motor in accordance with a sampled back electromotive force (emf) of that phase,
- 5 wherein the back emf of the phase is sampled only while the corresponding drive voltage
- 6 for the selected phase is substantially zero, wherein a frequency of a drive voltage of the
- 7 brushless DC motor is varied in accordance with the commutation control signal.
- 1 14. The apparatus of claim 13 wherein the drive voltage is substantially sinusoidal.

9/27

- 1 15. The apparatus of claim 13 wherein the drive voltage is substantially trapezoidal.
- 1 16. The apparatus of claim 13 wherein the sampled back emf is normalized with
- 2 respect to a commanded angular velocity of a motor rotor.
- 1 17. The apparatus of claim 13 further comprising:
- a speed control providing a speed control signal in accordance with difference
- 3 between a rotor angular velocity inferred from a frequency of the drive voltage and a
- 4 commanded angular velocity, wherein an amplitude of the drive voltage is varied in
- 5 accordance with the speed control signal.
- 1 18. The apparatus of claim 13 further comprising:
- a speed control providing a speed control signal in accordance with difference
- 3 between a rotor angular velocity inferred from a frequency of the back emf and a
- 4 commanded angular velocity, wherein an amplitude of the drive voltage is varied in
- 5 accordance with the speed control signal.
- 1 19. The apparatus of claim 13 further comprising:
- 2 an inverter;
- a waveform generator providing a drive waveform to the inverter, wherein a
- 4 frequency of the drive waveform varies in accordance with the commutation control
- 5 signal, wherein the inverter provides the drive voltage at a same frequency as the drive
- 6 waveform.

- 1 20. A method, comprising the steps of:
- driving a polyphase motor with a drive voltage having substantially the same
- 3 waveform as a back electromotive force (emf) generated by the motor; and
- sampling the back emf of a selected phase of the motor to determine positional
- 5 error of a motor roto only while a corresponding drive voltage of the selected phase is
- 6 substantially zero.
- 1 21. The method of claim 20 wherein the drive voltage and the back emf have a
- 2 substantially sinusoidal waveform.
- 1 22. The method of claim 20 wherein the drive voltage and the back emf have a
- 2 substantially trapezoidal waveform.

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